



SEQUENCE LISTING

<110> Bron, Sierd  
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Mueller, Joerg P.  
Van Dijl, Jan M.

<120> Twin-Arginine Translocation in Bacillus

<130> GC634-2

<140> US 09/954,737  
<141> 2001-09-17

<150> US 60/233,610  
<151> 2000-09-18

<160> 29

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<212> PRT  
<213> Escherichia coli

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Val Leu Leu Phe Gly Thr Lys Lys Leu Gly Ser Ile Gly Ser Asp Leu  
20 25 30  
Gly Ala Ser Ile Lys Gly Phe Lys Lys Ala Met Ser Asp Asp Glu Pro  
35 40 45  
Lys Gln Asp Lys Thr Ser Gln Asp Ala Asp Phe Thr Ala Lys Thr Ile  
50 55 60  
Ala Asp Lys Gln Ala Asp Thr Asn Gln Glu Gln Ala Lys Thr Glu Asp  
65 70 75 80  
Ala Lys Arg His Asp Lys Glu Gln Val  
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<210> 2  
<211> 67  
<212> PRT  
<213> Escherichia coli

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Met Gly Glu Ile Ser Ile Thr Lys Leu Leu Val Val Ala Ala Leu Val  
1 5 10 15  
Val Leu Leu Phe Gly Thr Lys Lys Leu Arg Thr Leu Gly Gly Asp Leu  
20 25 30  
Gly Ala Ala Ile Lys Gly Phe Lys Lys Ala Met Asn Asp Asp Asp Ala  
35 40 45  
Ala Ala Lys Lys Gly Ala Asp Val Asp Leu Gln Ala Glu Lys Leu Ser  
50 55 60  
His Lys Glu

65

<210> 3  
<211> 57  
<212> PRT  
<213> *Bacillus subtilis*

<400> 3  
Met Pro Ile Gly Pro Gly Ser Leu Ala Val Ile Ala Ile Val Ala Leu  
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Ile Ile Phe Gly Pro Lys Lys Leu Pro Glu Leu Gly Lys Ala Ala Gly  
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Asp Thr Leu Arg Glu Phe Lys Asn Ala Thr Lys Gly Leu Thr Ser Asp  
35 40 45  
Glu Glu Glu Lys Lys Glu Asp Gln  
50 55

<210> 4  
<211> 70  
<212> PRT  
<213> *Bacillus subtilis*

<400> 4  
Met Phe Ser Asn Ile Gly Ile Pro Gly Leu Ile Leu Ile Phe Val Ile  
1 5 10 15  
Ala Ile Ile Ile Phe Gly Pro Ser Lys Leu Pro Glu Ile Gly Arg Ala  
20 25 30  
Ala Lys Arg Thr Leu Leu Glu Phe Lys Ser Ala Thr Lys Ser Leu Val  
35 40 45  
Ser Gly Asp Glu Lys Glu Glu Lys Ser Ala Glu Leu Thr Ala Val Lys  
50 55 60  
Gln Asp Lys Asn Ala Gly  
65 70

<210> 5  
<211> 62  
<212> PRT  
<213> *Bacillus subtilis*

<400> 5  
Met Glu Leu Ser Phe Thr Lys Ile Leu Val Ile Leu Phe Val Gly Phe  
1 5 10 15  
Leu Val Phe Gly Pro Asp Lys Leu Pro Ala Leu Gly Arg Ala Ala Gly  
20 25 30  
Lys Ala Leu Ser Glu Phe Lys Gln Ala Thr Ser Gly Leu Thr Gln Asp  
35 40 45  
Ile Arg Lys Asn Asp Ser Glu Asn Lys Glu Asp Lys Gln Met  
50 55 60

<210> 6  
<211> 171  
<212> PRT  
<213> *Escherichia coli*

<400> 6  
Met Phe Asp Ile Gly Phe Ser Glu Leu Leu Val Phe Ile Ile Gly  
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Leu Val Val Leu Gly Pro Gln Arg Leu Pro Val Ala Val Lys Thr Val  
 20 25 30  
 Ala Gly Trp Ile Arg Ala Leu Arg Ser Leu Ala Thr Thr Val Gln Asn  
 35 40 45  
 Glu Leu Thr Gln Glu Leu Lys Leu Gln Glu Phe Gln Asp Ser Leu Lys  
 50 55 60  
 Lys Val Glu Lys Ala Ser Leu Thr Asn Leu Thr Pro Glu Leu Lys Ala  
 65 70 75 80  
 Ser Met Asp Glu Leu Arg Gln Ala Ala Glu Ser Met Lys Arg Ser Tyr  
 85 90 95  
 Val Ala Asn Asp Pro Glu Lys Ala Ser Asp Glu Ala His Thr Ile His  
 100 105 110  
 Asn Pro Val Val Lys Asp Asn Glu Ala Ala His Glu Gly Val Thr Pro  
 115 120 125  
 Ala Ala Ala Gln Thr Gln Ala Ser Ser Pro Glu Gln Lys Pro Glu Thr  
 130 135 140  
 Thr Pro Glu Pro Val Val Lys Pro Ala Ala Asp Ala Glu Pro Lys Thr  
 145 150 155 160  
 Ala Ala Pro Ser Pro Ser Ser Asp Lys Pro  
 165 170

<210> 7  
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 Met Ser Val Glu Asp Thr Gln Pro Leu Ile Thr His Leu Ile Glu Leu  
 1 5 10 15  
 Arg Lys Arg Leu Leu Asn Cys Ile Ile Ala Val Ile Val Ile Phe Leu  
 20 25 30  
 Cys Leu Val Tyr Phe Ala Asn Asp Ile Tyr His Leu Val Ser Ala Pro  
 35 40 45  
 Leu Ile Lys Gln Leu Pro Gln Gly Ser Thr Met Ile Ala Thr Asp Val  
 50 55 60  
 Ala Ser Pro Phe Phe Thr Pro Ile Lys Leu Thr Phe Met Val Ser Leu  
 65 70 75 80  
 Ile Leu Ser Ala Pro Val Ile Leu Tyr Gln Val Trp Ala Phe Ile Ala  
 85 90 95  
 Pro Ala Leu Tyr Lys His Glu Arg Arg Leu Val Val Pro Leu Leu Val  
 100 105 110  
 Ser Ser Ser Leu Leu Phe Tyr Ile Gly Met Ala Phe Ala Tyr Phe Val  
 115 120 125  
 Val Phe Pro Leu Ala Phe Gly Phe Leu Ala Asn Thr Ala Pro Glu Gly  
 130 135 140  
 Val Gln Val Ser Thr Asp Ile Ala Ser Tyr Leu Ser Phe Val Met Ala  
 145 150 155 160  
 Leu Phe Met Ala Phe Gly Val Ser Phe Glu Val Pro Val Ala Ile Val  
 165 170 175  
 Leu Leu Cys Trp Met Gly Ile Thr Ser Pro Glu Asp Leu Arg Lys Lys  
 180 185 190  
 Arg Pro Tyr Val Leu Val Gly Ala Phe Val Val Gly Met Leu Leu Thr  
 195 200 205  
 Pro Pro Asp Val Phe Ser Gln Thr Leu Leu Ala Ile Pro Met Tyr Cys  
 210 215 220  
 Leu Phe Glu Ile Gly Val Phe Phe Ser Arg Phe Tyr Val Gly Lys Gly  
 225 230 235 240

Arg Asn Arg Glu Glu Asn Asp Ala Glu Ala Glu Ser Glu Lys Thr  
245 250 255  
Glu Glu

<210> 8  
<211> 254  
<212> PRT  
<213> *Bacillus subtilis*

<400> 8  
Met Thr Arg Met Lys Val Asn Gln Met Ser Leu Leu Glu His Ile Ala  
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Phe Ile Ala Gly Phe Phe Leu Ala Lys Pro Ile Ile Val Tyr Leu Gln  
35 40 45  
Glu Thr Asp Glu Ala Lys Gln Leu Thr Leu Asn Ala Phe Asn Leu Thr  
50 55 60  
Asp Pro Leu Tyr Val Phe Met Gln Phe Ala Phe Ile Ile Gly Ile Val  
65 70 75 80  
Leu Thr Ser Pro Val Ile Leu Tyr Gln Leu Trp Ala Phe Val Ser Pro  
85 90 95  
Gly Leu Tyr Glu Lys Glu Arg Lys Val Thr Leu Ser Tyr Ile Pro Val  
100 105 110  
Ser Ile Leu Leu Phe Leu Ala Gly Leu Ser Phe Ser Tyr Tyr Ile Leu  
115 120 125  
Phe Pro Phe Val Val Asp Phe Met Lys Arg Ile Ser Gln Asp Leu Asn  
130 135 140  
Val Asn Gln Val Ile Gly Ile Asn Glu Tyr Phe His Phe Leu Leu Gln  
145 150 155 160  
Leu Thr Ile Pro Phe Gly Leu Leu Phe Gln Met Pro Val Ile Leu Met  
165 170 175  
Phe Leu Thr Arg Leu Gly Ile Val Thr Pro Met Phe Leu Ala Lys Ile  
180 185 190  
Arg Lys Tyr Ala Tyr Phe Thr Leu Leu Val Ile Ala Ala Leu Ile Thr  
195 200 205  
Pro Pro Glu Leu Leu Ser His Met Met Val Thr Val Pro Leu Leu Ile  
210 215 220  
Leu Tyr Glu Ile Ser Ile Leu Ile Ser Lys Ala Ala Tyr Arg Lys Ala  
225 230 235 240  
Gln Lys Ser Ser Ala Ala Asp Arg Asp Val Ser Ser Gly Gln  
245 250

<210> 9  
<211> 245  
<212> PRT  
<213> *Bacillus subtilis*

<400> 9  
Met Asp Lys Lys Glu Thr His Leu Ile Gly His Leu Glu Glu Leu Arg  
1 5 10 15  
Arg Arg Ile Ile Val Thr Leu Ala Ala Phe Phe Leu Phe Leu Ile Thr  
20 25 30  
Ala Phe Leu Phe Val Gln Asp Ile Tyr Asp Trp Leu Ile Arg Asp Leu  
35 40 45  
Asp Gly Lys Leu Ala Val Leu Gly Pro Ser Glu Ile Leu Trp Val Tyr

|   |     |     |
|---|-----|-----|
| 50  | 55  | 60  |
| Met Met Leu Ser Gly Ile Cys Ala Ile Ala Ala Ser Ile Pro Val Ala |     |     |
| 65  | 70  | 75  |
| Ala Tyr Gln Leu Trp Arg Phe Val Ala Pro Ala Leu Thr Lys Thr Glu |     | 80  |
| 85  | 90  | 95  |
| Arg Lys Val Thr Ile Met Tyr Ile Met Tyr Ile Pro Gly Leu Phe Ala |     |     |
| 100   | 105 | 110 |
| Leu Phe Leu Ala Gly Ile Ser Phe Gly Tyr Phe Val Leu Phe Pro Ile |     |     |
| 115   | 120 | 125 |
| Val Leu Ser Phe Leu Thr His Leu Ser Ser Gly His Phe Glu Thr Met |     |     |
| 130   | 135 | 140 |
| Phe Thr Ala Asp Arg Tyr Phe Arg Phe Met Val Asn Leu Ser Leu Pro |     |     |
| 145   | 150 | 155 |
| Phe Gly Phe Leu Phe Glu Met Pro Leu Val Val Met Phe Leu Thr Arg |     | 160 |
| 165   | 170 | 175 |
| Leu Gly Ile Leu Asn Pro Tyr Arg Leu Ala Lys Ala Arg Lys Leu Ser |     |     |
| 180   | 185 | 190 |
| Tyr Phe Leu Leu Ile Val Val Ser Ile Leu Ile Thr Pro Pro Asp Phe |     |     |
| 195   | 200 | 205 |
| Ile Ser Asp Phe Leu Val Met Ile Pro Leu Leu Val Leu Phe Glu Val |     |     |
| 210   | 215 | 220 |
| Ser Val Thr Leu Ser Ala Phe Val Tyr Lys Lys Arg Met Arg Glu Glu |     |     |
| 225   | 230 | 235 |
| Thr Ala Ala Ala Ala   |     | 240 |
|   | 245 |     |

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 <211> 63  
 <212> PRT  
 <213> *Bacillus alcalophilus*

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| <400> 10  |    |    |    |
| Met Gly Gly Leu Ser Val Gly Ser Val Val Leu Ile Ala Leu Val Ala |    |    |    |
| 1   | 5  | 10 | 15 |
| Leu Leu Ile Phe Gly Pro Lys Lys Leu Pro Glu Leu Gly Lys Ala Ala |    |    |    |
| 20  | 25 | 30 |    |
| Gly Ser Thr Leu Arg Glu Phe Lys Asn Ala Thr Lys Gly Leu Ala Asp |    |    |    |
| 35  | 40 | 45 |    |
| Asp Asp Asp Asp Thr Lys Ser Thr Asn Val Gln Lys Glu Lys Ala     |    |    |    |
| 50  | 55 | 60 |    |

<210> 11  
 <211> 272  
 <212> PRT  
 <213> *Bacillus alcalophilus*

|   |    |    |    |
|---|----|----|----|
| <400> 11  |    |    |    |
| Met Thr Met Met Thr Pro Asn Gln Gln Thr Ser Lys Lys Lys Arg     |    |    |    |
| 1   | 5  | 10 | 15 |
| Lys Gly Arg Lys Gly Arg Val Pro Met Gln Asp Met Ser Ile Met Asp |    |    |    |
| 20  | 25 | 30 |    |
| His Ala Glu Glu Leu Arg Arg Arg Ile Phe Val Val Leu Ala Phe Phe |    |    |    |
| 35  | 40 | 45 |    |
| Ile Val Ala Leu Ile Gly Gly Phe Phe Leu Ala Val Pro Val Ile Thr |    |    |    |
| 50  | 55 | 60 |    |
| Phe Leu Gln Asn Ser Pro Gln Ala Ala Asp Met Pro Phe Asn Ala Phe |    |    |    |
| 65  | 70 | 75 | 80 |

Arg Leu Thr Asp Pro Leu Arg Val Tyr Met Asn Phe Ala Val Ile Thr  
                   85                  90                  95  
 Ala Leu Val Leu Ile Ile Pro Val Ile Leu Tyr Gln Leu Trp Ala Phe  
                   100              105              110  
 Val Ser Pro Gly Leu Lys Glu Asn Glu Gln Lys Ala Thr Leu Ala Tyr  
                   115              120              125  
 Ile Pro Ile Ala Phe Leu Leu Phe Leu Ala Gly Ile Ala Phe Ser Tyr  
                   130              135              140  
 Phe Ile Leu Leu Pro Phe Val Ile Ser Phe Met Gly Gln Met Ala Asp  
                   145              150              155              160  
 Arg Leu Glu Ile Asn Glu Met Tyr Gly Ile Asn Glu Tyr Phe Ser Phe  
                   165              170              175  
 Leu Phe Gln Leu Thr Ile Pro Phe Gly Leu Leu Phe Gln Leu Pro Val  
                   180              185              190  
 Val Val Met Phe Leu Thr Arg Leu Gly Val Val Thr Pro Thr Phe Leu  
                   195              200              205  
 Arg Lys Ile Arg Lys Tyr Ala Tyr Phe Ala Leu Leu Val Ile Ala Gly  
                   210              215              220  
 Ile Ile Thr Pro Pro Glu Leu Thr Ser His Leu Phe Val Thr Val Pro  
                   225              230              235              240  
 Met Leu Ile Leu Tyr Glu Ile Ser Ile Thr Ile Ser Ala Ile Thr Tyr  
                   245              250              255  
 Arg Lys Tyr His Gly Thr Thr Asp His Asn Gly Gln Glu Ser Ala Lys  
                   260              265              270

<210> 12  
 <211> 35  
 <212> DNA  
 <213> Artificial Sequence

<220>  
 <223> primer

<400> 12  
 cccaaagctta tgaaaggag ggctttttg aatgg                  35

<210> 13  
 <211> 26  
 <212> DNA  
 <213> Artificial Sequence

<220>  
 <223> primer

<400> 13  
 gcggatccaa agctgagcac gatcgg                          26

<210> 14  
 <211> 39  
 <212> DNA  
 <213> Artificial Sequence

<220>  
 <223> primer

<400> 14  
 cccaaagctta aaaagaaaaga agatcagtaa gtttaggatg                  39

|                              |  |    |
|------------------------------|--|----|
| <210> 15                     |  |    |
| <211> 25                     |  |    |
| <212> DNA                    |  |    |
| <213> Artificial Sequence    |  |    |
|                              |  |    |
| <220>                        |  |    |
| <223> primer                 |  |    |
|                              |  |    |
| <400> 15                     |  |    |
| gcggatccaa gtcctgagaa atccg  |  | 25 |
|                              |  |    |
| <210> 16                     |  |    |
| <211> 21                     |  |    |
| <212> DNA                    |  |    |
| <213> Artificial Sequence    |  |    |
|                              |  |    |
| <220>                        |  |    |
| <223> primer                 |  |    |
|                              |  |    |
| <400> 16                     |  |    |
| ggaattcgtg ggacggctac c      |  | 21 |
|                              |  |    |
| <210> 17                     |  |    |
| <211> 21                     |  |    |
| <212> DNA                    |  |    |
| <213> Artificial Sequence    |  |    |
|                              |  |    |
| <220>                        |  |    |
| <223> primer                 |  |    |
|                              |  |    |
| <400> 17                     |  |    |
| cgggatccat catgggaagc g      |  | 21 |
|                              |  |    |
| <210> 18                     |  |    |
| <211> 26                     |  |    |
| <212> DNA                    |  |    |
| <213> Artificial Sequence    |  |    |
|                              |  |    |
| <220>                        |  |    |
| <223> primer                 |  |    |
|                              |  |    |
| <400> 18                     |  |    |
| gggttaccgg aaaacgcttg atcagg |  | 26 |
|                              |  |    |
| <210> 19                     |  |    |
| <211> 22                     |  |    |
| <212> DNA                    |  |    |
| <213> Artificial Sequence    |  |    |
|                              |  |    |
| <220>                        |  |    |
| <223> primer                 |  |    |
|                              |  |    |
| <400> 19                     |  |    |
| cgggatcctt tgggcgatag cc     |  | 22 |
|                              |  |    |
| <210> 20                     |  |    |

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| <211> 42                                       |    |
| <212> DNA                                      |    |
| <213> Artificial Sequence                      |    |
| <br>   |    |
| <220>  |    |
| <223> primer                                   |    |
| <br>   |    |
| <400> 20                                       |    |
| gaggatccat gaggagagag gggatcttga atggcatacg ac | 42 |
| <br>   |    |
| <210> 21                                       |    |
| <211> 27                                       |    |
| <212> DNA                                      |    |
| <213> Artificial Sequence                      |    |
| <br>   |    |
| <220>  |    |
| <223> primer                                   |    |
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| <400> 21                                       |    |
| cgatcctgca ggacctcatac ggattgc                 | 27 |
| <br>   |    |
| <210> 22                                       |    |
| <211> 27                                       |    |
| <212> DNA                                      |    |
| <213> Artificial Sequence                      |    |
| <br>   |    |
| <220>  |    |
| <223> primer                                   |    |
| <br>   |    |
| <400> 22                                       |    |
| gttaggatccg cgcctaactt ctcaagc                 | 27 |
| <br>   |    |
| <210> 23                                       |    |
| <211> 25                                       |    |
| <212> DNA                                      |    |
| <213> Artificial Sequence                      |    |
| <br>   |    |
| <220>  |    |
| <223> primer                                   |    |
| <br>   |    |
| <400> 23                                       |    |
| ataagaattca aaaaggaaga gtatg                   | 25 |
| <br>   |    |
| <210> 24                                       |    |
| <211> 24                                       |    |
| <212> DNA                                      |    |
| <213> Artificial Sequence                      |    |
| <br>   |    |
| <220>  |    |
| <223> primer                                   |    |
| <br>   |    |
| <400> 24                                       |    |
| ctggggatcc aaaaacagga aggc                     | 24 |
| <br>   |    |
| <210> 25                                       |    |
| <211> 35                                       |    |
| <212> DNA                                      |    |

|   |    |
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| <213> Artificial Sequence               |    |
| <220>                                   |    |
| <223> primer                            |    |
| <400> 25                                |    |
| gagaaggatcg acgcagcatt tacttcaaag gcccc | 35 |
| <210> 26                                |    |
| <211> 26                                |    |
| <212> DNA                               |    |
| <213> Artificial Sequence               |    |
| <220>                                   |    |
| <223> primer                            |    |
| <400> 26                                |    |
| accgggtcga ccgtcggtt acaacg             | 26 |
| <210> 27                                |    |
| <211> 23                                |    |
| <212> DNA                               |    |
| <213> Artificial Sequence               |    |
| <220>                                   |    |
| <223> primer                            |    |
| <400> 27                                |    |
| gggaattcat ggcctgccc gtt                | 23 |
| <210> 28                                |    |
| <211> 24                                |    |
| <212> DNA                               |    |
| <213> Artificial Sequence               |    |
| <220>                                   |    |
| <223> primer                            |    |
| <400> 28                                |    |
| caaggatccc gaattaaagga gtgg             | 24 |
| <210> 29                                |    |
| <211> 27                                |    |
| <212> DNA                               |    |
| <213> Artificial Sequence               |    |
| <220>                                   |    |
| <223> primer                            |    |
| <400> 29                                |    |
| ggtctgcagc tgcactaagc gggcgcc           | 27 |